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NASA Activities

National Aeronautics and Space Administration

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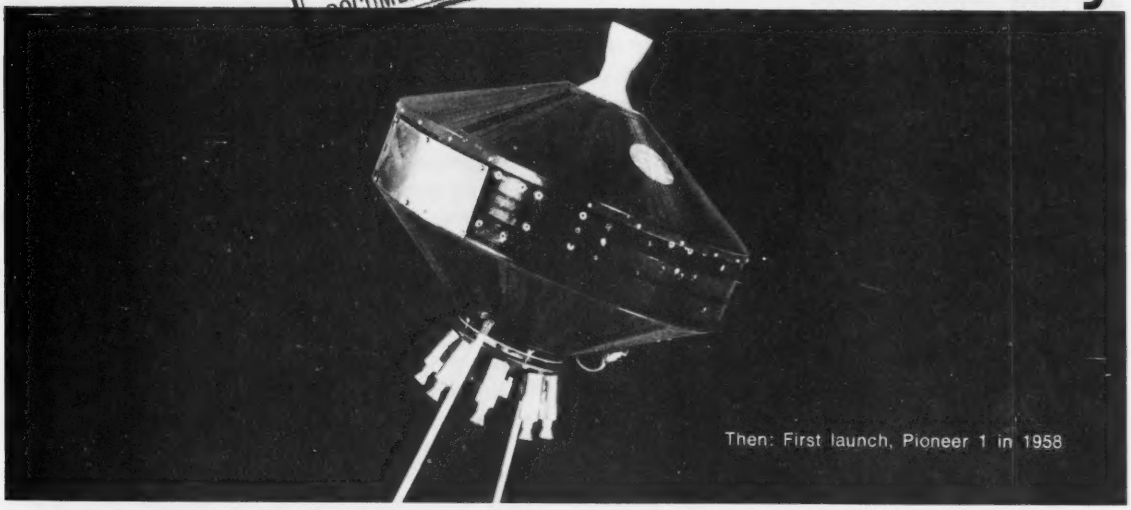
20th Anniversary



Then: First launch, Pioneer 1 in 1958

Now: Space Shuttle, to orbit in 1979

Cover

How Things Have Changed—First spacecraft launched by NASA on Oct. 11, 1958, was the 38.28-kilogram (84-pound) Pioneer 1. The deep-space probe never reached the Moon, but it did transmit 43 hours of data. In 1978, the Space Shuttle *Enterprise* is being made ready for long and extensive journeys in space. The 64-metric ton (150,000-lb.) vehicle, comparable to a DC–9 airplane, will carry a seven-person crew and a cargo of 29,500 kg. (or 65,000 lbs.) into orbit and remain there for 7 to 30 days before returning to Earth.

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Letter from Washington

Dear Colleagues:

By the time a man or a woman has lived for 20 years, a new individuality has been established, physical maturity has been achieved, important experiences have been undergone and digested, there have been some triumphs and some tragedies, the outlines of the individual's role in society are beginning to come into focus, and it becomes possible to do some sensible planning and make some educated guesses about the future. Most importantly, a unique new entity with largely undetermined potential has come to exist in the world.

On its 20th anniversary, NASA—composed of some 23,000 men and women—is just such an entity. We are a unique agency, mandated by the people of our country through their elected representatives to develop and utilize space technology both for immediate practical application and to expand our knowledge of the Earth, its environment, the solar system and the universe. We are charged with assisting the Department of Defense in the use of space to maintain the security of our nation, and with the promotion of international cooperation in space for peaceful purposes. An important part of our charter calls for research and development to maintain U.S. leadership in aeronautics, and to improve civil and military aeronautical vehicles while minimizing their energy consumption and environmental degradation. We are further charged with the dissemination to all potential users of new knowledge and technology acquired in the course of all these activities, and, alone among Federal agencies, we are required by law to "provide for the widest practicable and appropriate dissemination of information concerning (our) activities and the results thereof.

As in the case of a 20-year-old person, we have achieved the approximate shape and size we can expect to live with for the foreseeable future; we have some learning experiences under our collective belts; we have tasted both triumph and tragedy, although happily more of the former than the latter; our functions in the interests of our people are beginning to come clear; and we are beginning to see some of the directions in which we may want to go in the years ahead.

Like any reasonably intelligent and normally healthy 20-year-old, we have reason to be proud of our accomplishments thus far, and confident of further accomplishments in the future as we gain experience and knowledge.

We have, after all, in just two decades, for the first time ever, put life from the planet Earth on another body of our solar system, and in our explorations of the Moon learned more about the nature and origins of that system than humanity was able to determine in all the centuries that went before.

In those two eventful decades we have landed extensions of our intelligence on Mars, begun an automated investigation that will eventually extend to all the planets orbiting the Sun, achieved significant increase in our knowledge of Sun-Earth interactions and relationships, and through remote sensing satellites made order-of-magnitude improvements in how we view the natural and man-made phenomena of the whole Earth, as a first step on the way to better management of all our resources. And we have put astronomy observatories into orbit above the obscuring atmosphere, which are beginning to supply data that may well change our conception of the universe.

Closer to home we have initiated a communications revolution. Though barely begun, the communications satellite program has tied the nations and peoples of our planet together in a way never before possible and it promises the benefits of intercommunity contact to the most remote and isolated areas. We have pioneered the use of high-powered broadcast satellites to bring a variety of public services to communities otherwise without them. And we have developed aeronautical technologies that promise 50 percent fuel savings for airliners, as well as quieter, more economical, safer and more convenient long and short distance air travel.

In our 20th year, we are deeply involved in solving the primary problems of our time—through remote sensing helping to locate new sources of fossil fuels while working with the Department of Energy to develop alternate energy resources.

With passenger cars alone burning almost a third of all petroleum products used in this country each year and causing most of the air pollution that blights our

metropolitan areas, we are applying our scientific and engineering expertise to improving auto efficiency, economy and environmental acceptability and to developing advanced auto propulsion systems.

Finally, exactly as is true of a man or a woman, the future from the perspective of 20 years is full of challenge, excitement and opportunity. Consider, for example, that the 12 months following our 20th anniversary will see, among other events:

- the launch of the second HEAO to follow up the major astronomical discoveries of its predecessor;
- the arrival of the Pioneer orbiter and probes at Venus;
- the exploration of Jupiter and its moons by both Voyagers; and
- the first orbital test flight of the Shuttle.

Beyond our 21st year, we can see the Shuttle evolving as the major factor in all our operations in space, facilitating and accelerating progress toward nearly all our goals.

The two Vikings, Pioneers 10 and 11, Voyagers 1 and 2, the Galileo mission to Jupiter, the Pioneer investigation of Venus and its atmosphere, will greatly enhance our understanding of the origin, evolution and current nature of the solar system and thus of our own Earth, providing us with an improved ability to preserve, protect and manage it for the benefit of all who live here. Follow-on missions to Mars, including the return of a sample of its enigmatic soil, a lunar polar orbiter, a Venus imaging radar orbiter, a Saturn orbiter with Saturn and Titan probes, and comet rendezvous—all currently under serious study —have the potential to improve that understanding ability still further.

The Solar-Polar out-of-ecliptic mission, the planned Solar Mesospheric Explorer, and a possible solar probe will add to our knowledge of the Sun-Earth cause and effect relationships of such primary importance to all life on our planet, and help us to understand, predict and perhaps eventually to control to some degree the weather processes that affect us in such a basic way.

Man's eon-long efforts to understand the fundamental nature of time, matter and energy will be advanced an order of magnitude in the next decade by a whole new generation of instruments of which the Space Telescope is the centerpiece and key. The contributions of the Space Telescope to our understanding of the physics of the universe are likely to dwarf all but the most fundamental discoveries of the past. Follow-on High Energy Astronomy observatories, ultra-violet, extreme ultra-violet, infra-red and gamma ray instruments will complement and supplement the Space Telescope and together bring us measurably closer to an understanding of the nature of the universe and the place of Earth and its inhabitants in relation to it.

As we develop our Earth-sensing capabilties with Landsat, Seasat, Nimbus, Magsat, GEOS, the Applications Explorer Missions, their follow-on systems and others, we will learn to integrate the data from all such systems into a continuous, accurate, global information system of immense usefulness to all the nations and people of the Earth.

The capability provided by the Shuttle to build large antennas and supporting facilities in space will lead to an enormous advance in the field of space communications that can change society. Such public telecommunications services as electronic mail, medical information delivery, continuing interactive education and broad information access await only positive decisions.

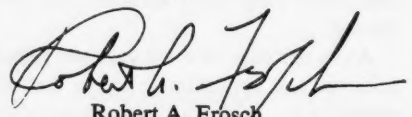
The same Shuttle capability also will lead to new construction techniques which could make beamed solar power a reality if and when that concept appears to be economically viable.

There is even a very real, although unquantifiable, possibility in the foreseeable future through our proposed Search for Extra-terrestrial Intelligence program, for contact with other intelligent beings in the universe, with the major changes to human society that such contact would bring.

In short, on our 20th anniversary, we at NASA can take pride in what we have already accomplished, satisfaction from the knowledge that we are doing useful work on the frontiers of science and technology for the benefit of our people and our country, and exhilaration at the prospects which lie ahead for the continued expansion of human knowledge and the improvement of the condition of people on the planet Earth.

Truly a unique new entity has come to exist in the world, an entity of which each one of us can be proud to be a part.

Sincerely,

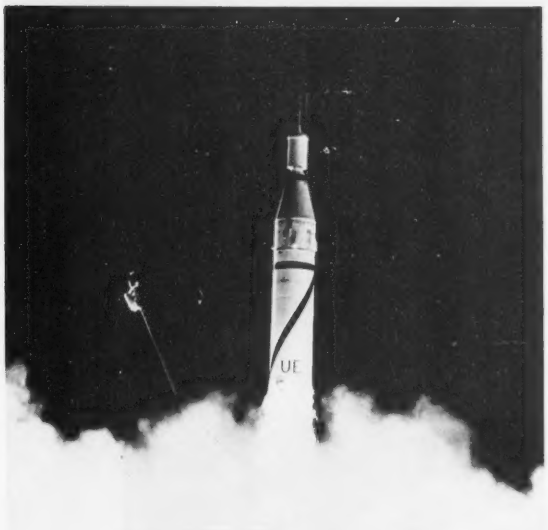


Robert A. Frosch

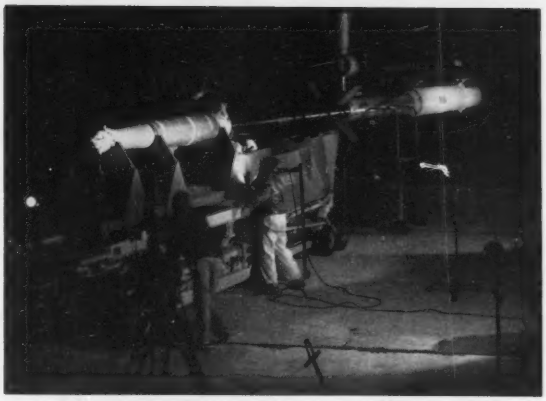
NASA—Fully Grown at 20

The increase in space knowledge and the proliferation of space-related ideas and tangible results in just a fifth of a century have been stunning. Things unheard of in the first half of the 20th Century go almost unnoticed today. NASA people and programs have helped to make dreams become reality in a relatively short lifetime. Many—by no means all—of NASA's accomplishments are pictured in the following pages.

It all began in 1958 when Dr. T. Keith Glennan (right) and Dr. Hugh L. Dryden were sworn in as first NASA Administrator and Deputy by President Eisenhower.

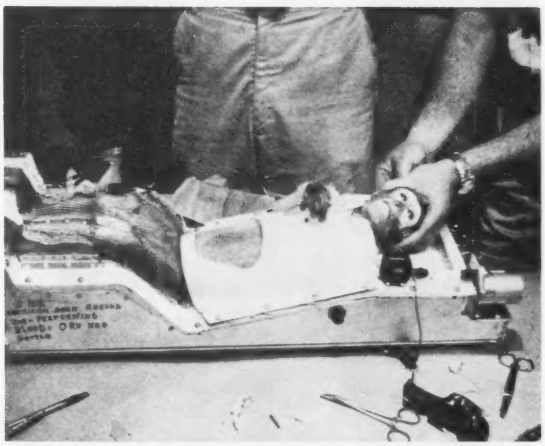


Explorer 1, weighing 30 pounds, America's first satellite.

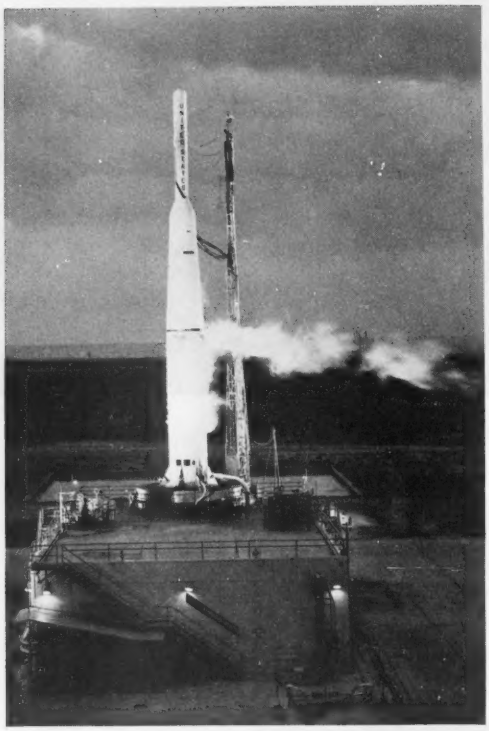


World's first six-stage, solid-fuel rocket, launched 1959.

Explorer 6 returned first crude TV photo of Earth in 1959.

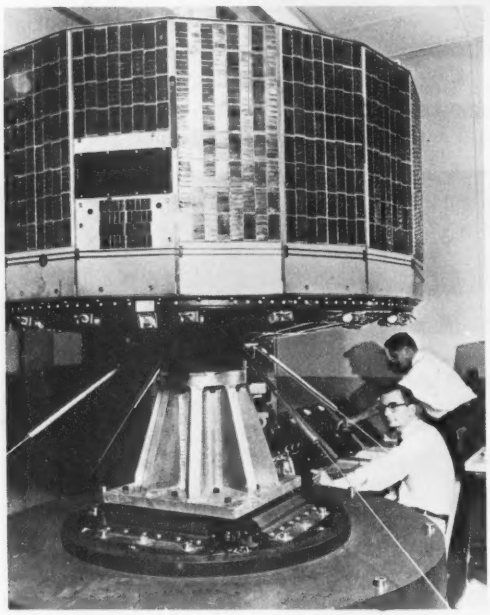


Successful flight of Jupiter spacecraft with "Able" aboard.

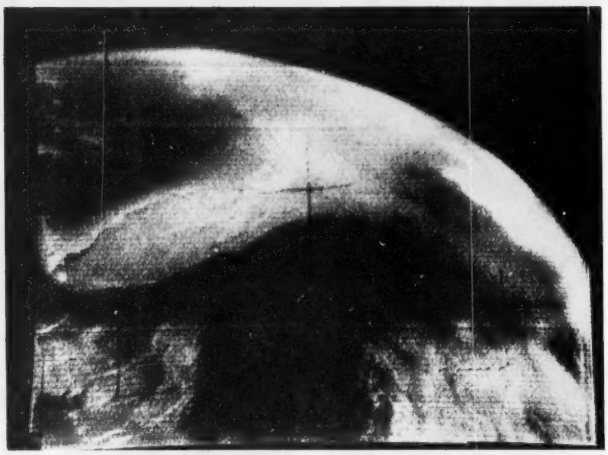


Pioneer 5 measured Earth to Venus radiation and magnetic fields.

Neil Armstrong test-flew "hot-nose" X–15 at 1,254 mph.



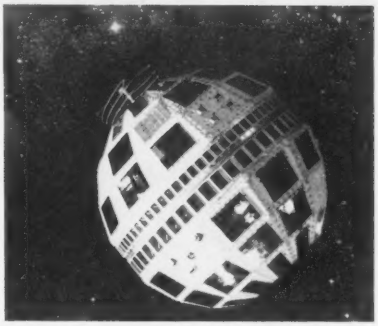
Tiros 1, first weather satellite, went 460 miles up.



An unprecedented 30,000 photos of weather from space came back from Tiros.

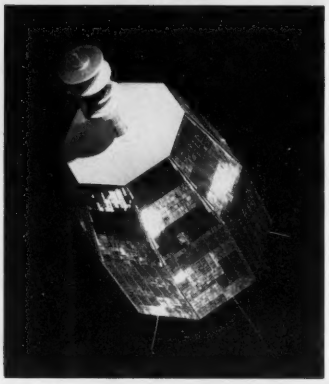
In 1961 President Kennedy committed the U.S. to Moon landing.

Alan Shepard leaves Freedom 7, after first U.S. manned flight.

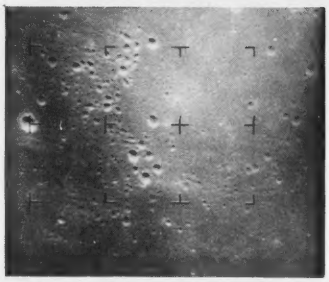


Telstar 1, first privately financed spacecraft.

John Glenn, after first U.S. orbital flight on Freedom 7.



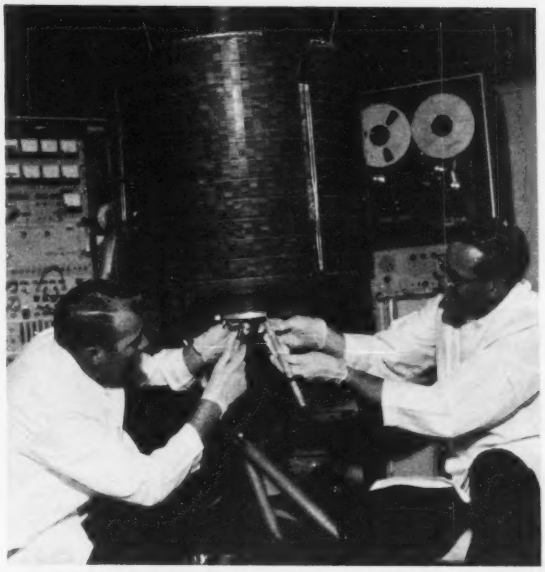
Relay 1 sent first live TV signals across the Pacific.



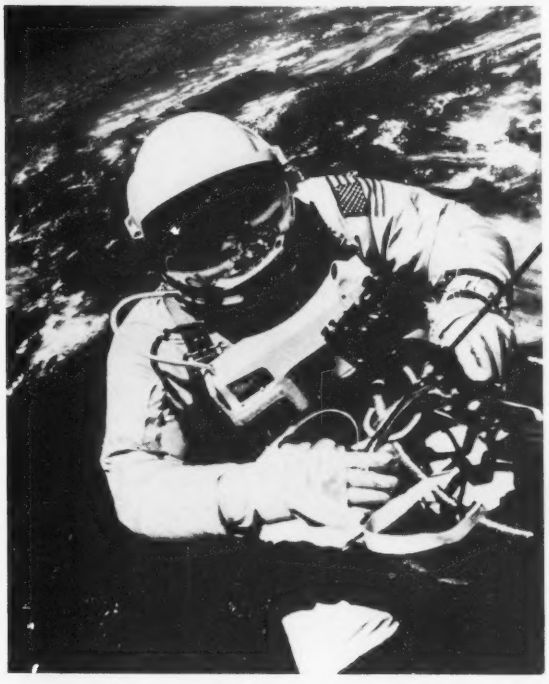
Ranger 7 sent back 4,300 Moon pictures before lunar impact.

A stage of Saturn V, launch vehicle for 13 Apollo missions, en-route to KSC from tests in Mississippi.

Mariner 4 took first closeup pictures of Mars in 1965.

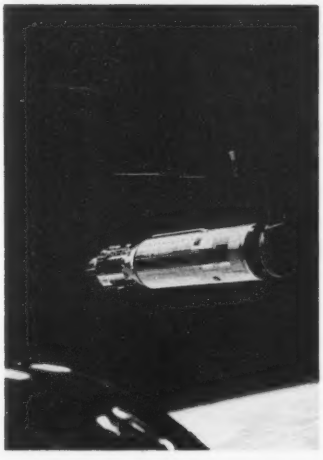


Intelsat 1 (Early Bird 1), first commercial communications satellite.

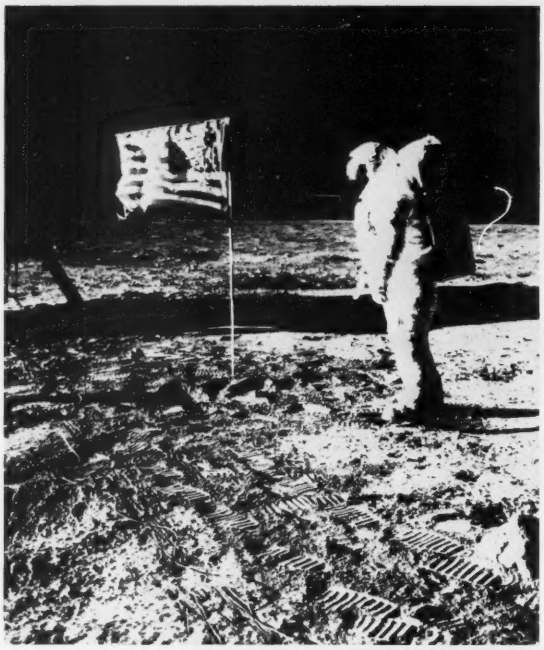


Edward White, on Gemini 4, the first American to walk in space.

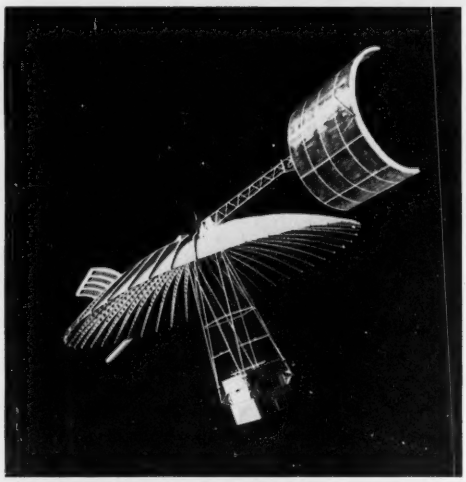
Surveyor 1 took pictures of its own shadow on the Moon.



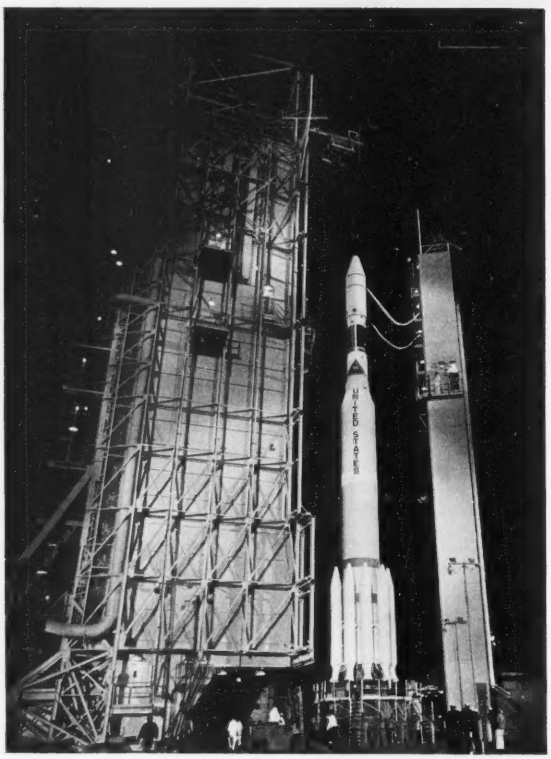
Gemini 8 docked with Agena vehicle for a "first" in 1966.



Apollo 11—the mandate is fulfilled.

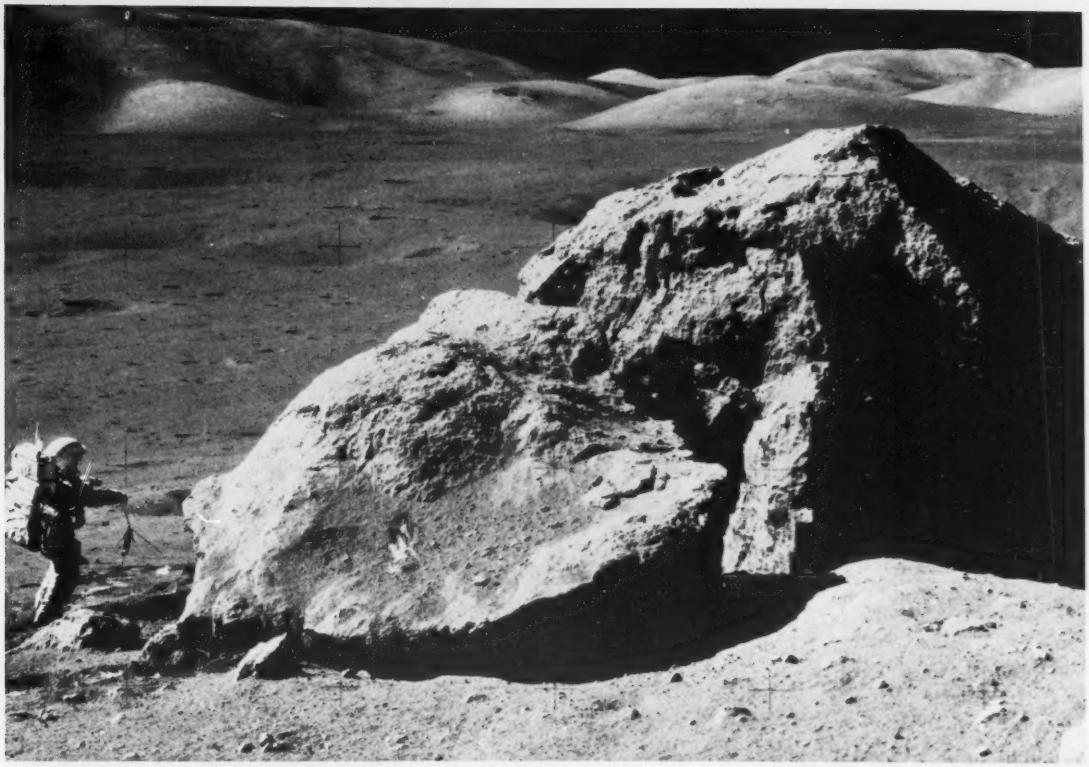


First Application Technology Satellite, launched 1972.

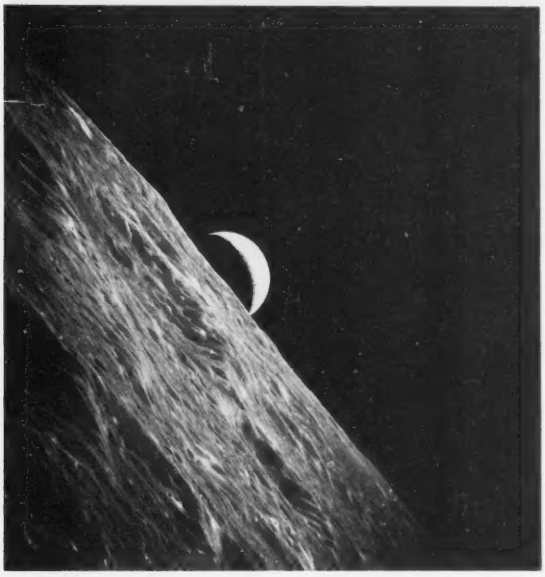


The first Earth resources technology satellite (Landsat).

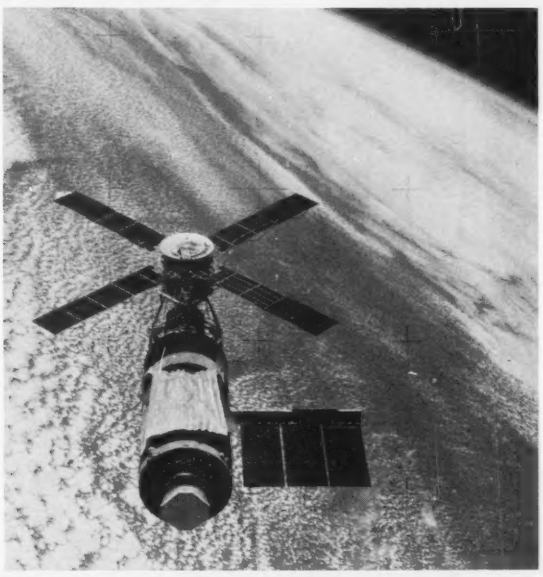
Clearest ever view of the Earth, taken by crew of Apollo 17.



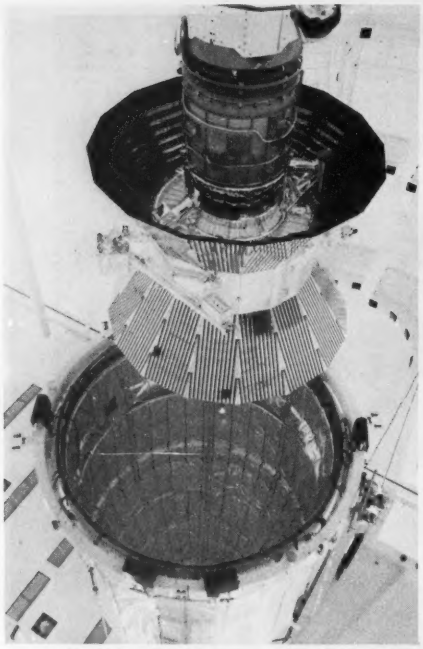
On the Moon for the last time, Harrison Schmitt, Apollo 17.



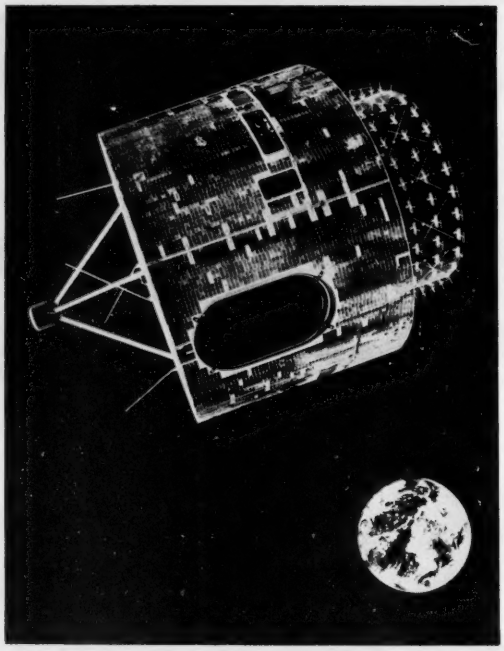
The far side of the Moon, at finale of Moon missions.



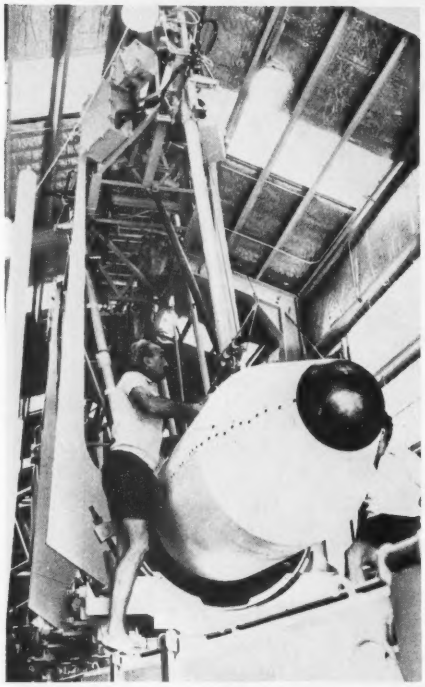
Though troubled, Skylab was manned for 514 days, is still aloft.



West-German-built Helios 1 launched in 1974 for solar probes.

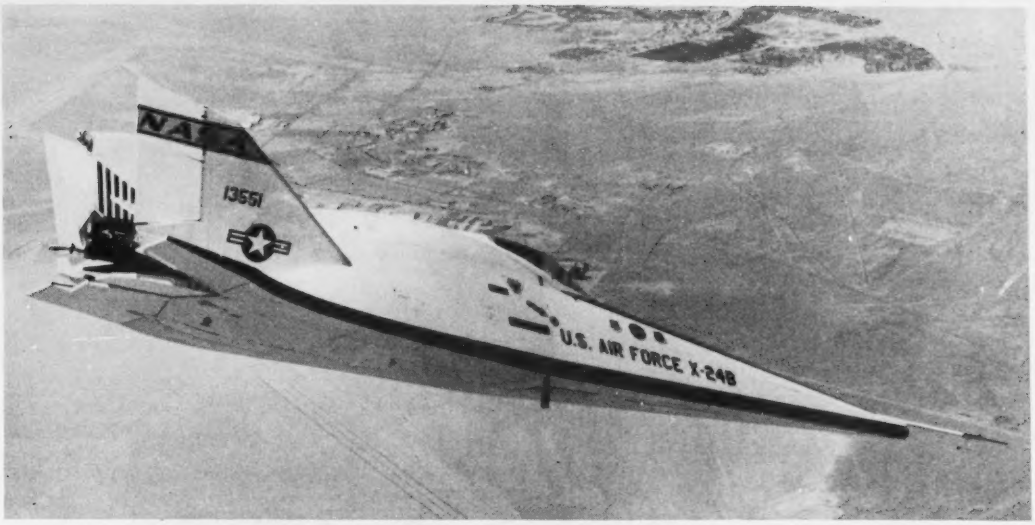


The Synchronous Meterological Satellite for day-night weather monitoring.

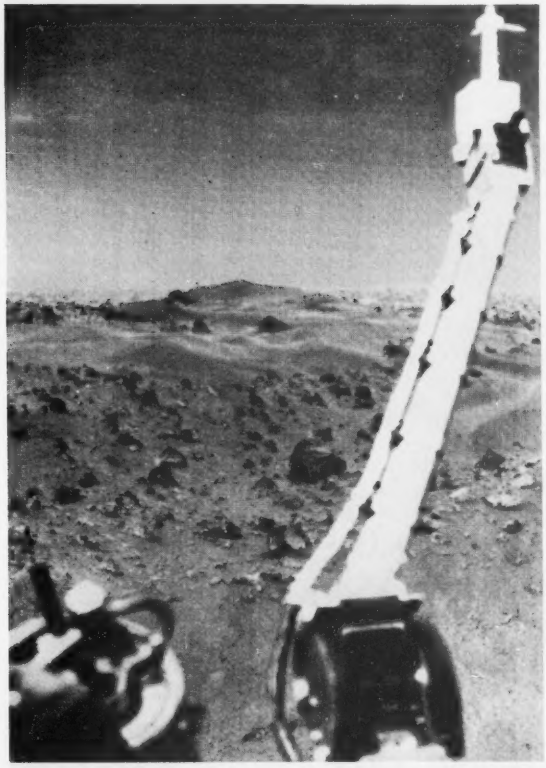


Upper atmosphere investigations by Italian-built San Marco.

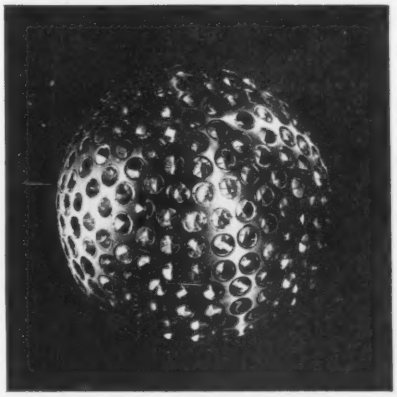
Russians and Americans share spacecraft during ASTP, 1975.



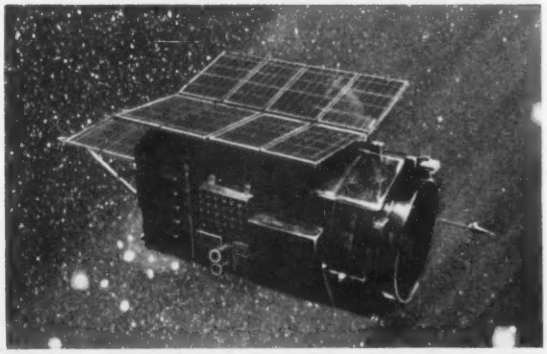
Final rocket-powered flight was flown by the X–24B, 1975.



Viking instruments took close-up photos of Mars.



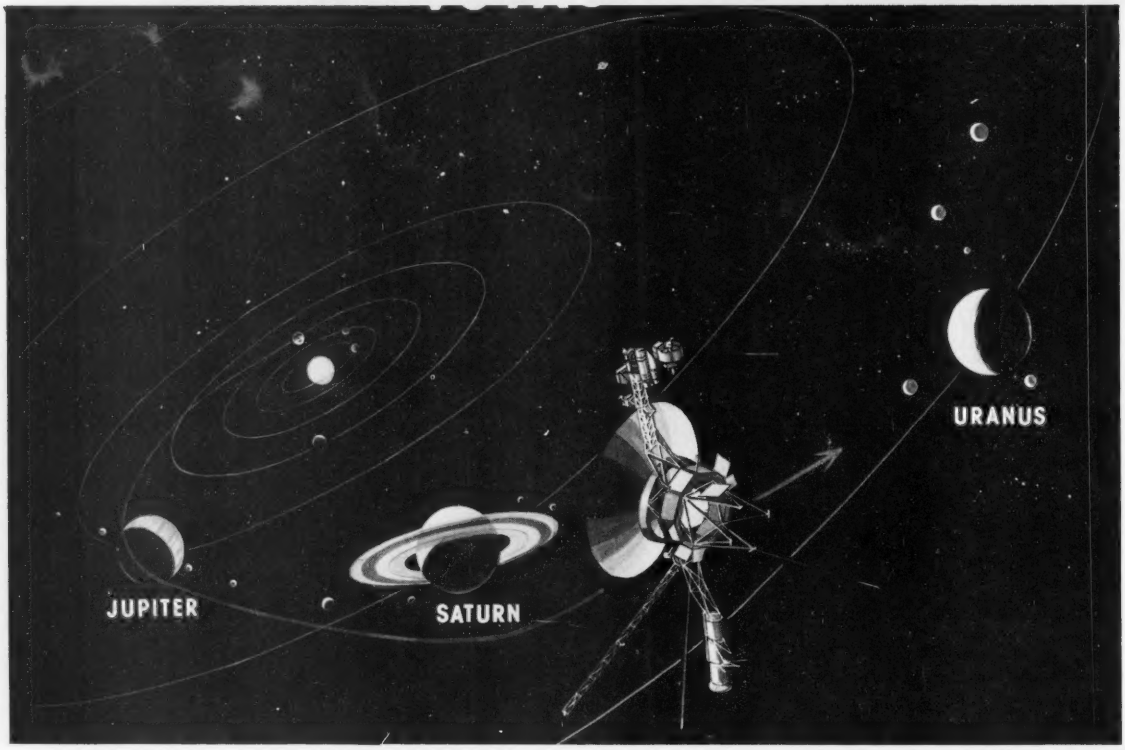
The LAGEOS satellite can help predict Earthquakes.



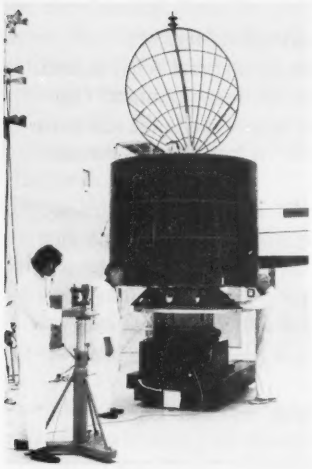
HEAO 1 studies astronomy in the far reaches of the universe.

The XV–15, with tilt rotors, makes its first hover flight.

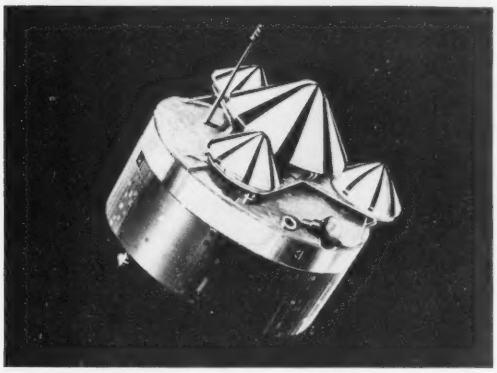
Two Voyagers are enroute to Jupiter and Saturn.



The HIMAT aircraft for research in low-cost flight research.



Palapa–B and sister satellite handle Indonesian communications.



Two Pioneer-Venus spacecraft, now enroute to our sister planet.

Some Private Opinions about NASA

A sampling of the attitudes of some Very Important People toward NASA programs produced the following collection of expressions.

Senator Edward M. Kennedy (D.-Mass): "The achievements of the United States space program have not only widened the range of human knowledge, but have also served to unite all Americans and indeed, all nations of the world in a common adventure of discovery."

Senator Adlai E. Stevenson (D.-Ill.), Chairman of the Senate Subcommittee on Science, Technology and Transportation: "I'm interested in what the space program *will* mean to people. We are entering the Shuttle era, which can bring the benefits of space back to Earth. Our challenge is to seize this opportunity and make it a reality."

Representative Olin E. Teague (D.-Ill.), Chairman of the House Committee on Science and Technology: "Just as Columbus opened a new world for Europe, our space effort has opened up new frontiers to our nation and the world which expands our resources and knowledge, bolsters our economy, stimulates technology, and fosters international cooperation for the benefit of all mankind."

Andrew Young, U.S. Ambassador to the United Nations: "The U.S. program to explore outer space produced some of the most outstanding technical achievements the world has ever known. I hope our technological success will benefit people the world over."

Jerry Brown, Governor of California: "We're divided among arbitrary geographical lines, separated into ethnic categories, and divided along various linguistic groups, but when we look at the Earth and the human species from a few hundred miles up, we can't help but sense the oneness of the human race."

Richard A. Frank, Administrator, National Oceanic and Atmospheric Administration: "The space program has given mankind today's most exciting technology to provide new understanding of the Earth's environment, and to help us live more productively."

Stuart Eizenstat, Domestic Affairs Advisor to President Carter: "Before my tour and visits here [to KSC], I was intellectually committed to our country's space program, but now I'm personally committed. I don't think you can compare the advances we have made in other fields to some of the great and important advances we have taken in our space program."

Dr. Joseph V. Charyk, President of COMSAT: "It [the space program] has represented the opportunity, through allowing us a role in the development of space communications technology, to participate personally in a global telecommunications revolution with major economic, political and educational connotations for the world of the future."

Walter Cronkite, Anchorman, CBS: "Never has a free people made such a commitment for purely peaceful purposes as did those of the United States in choosing to conquer space. Their agent was the National Aeronautics and Space Administration—and it performed magnificently in their name."

David Brinkley, Anchorman, NBC: "For me the space program—and particularly the Moon landing—was an exciting national achievement at a time in our history when we needed one."

On the set of the forthcoming movie, Star Trekkers (L. to R.) Wise, Roddenberry, Shatner, De Forest Kelley, and Nimoy.

Gene Roddenberry, Executive Producer of "Star Trek": "Why our space program? Why, indeed, did we trouble to look past the next mountain? Our prime obligation to ourselves is to make the unknown known. *We are on a journey to keep an appointment with whatever we are.*"

Robert Wise, Director of "Star Trek": "A reflection of my feelings about the space program is found in a quotation from Charles A. Lindbergh's 'Autobiography of Values.' It reads, 'Whether outwardly or inwardly, whether in space or time, the farther we penetrate the unknown, the vaster and more marvelous it becomes.' "

William Shatner, "Capt. Kirk" of "Star Trek": "For me, NASA is the focus of the great adventure of our time. A sense of the unknown has always lured mankind and the greatest of the unknowns of today is outer space. The terrors, the joys and the sense of accomplishment are epitomized in the space program."

Leonard Nimoy, "Mr. Spock" of "Star Trek": "The space program has turned fantasy into reality, and made it even more exciting. What fiction could match—in drama or suspense—man's first walk on the Moon, for example? The achievements of NASA have thrilled all of us, enlightened us—and made us very proud."

Mission Specialists Selected for Spacelab 1

Astronauts Dr. Owen K. Garriott and Dr. Robert A. Parker have been selected by NASA to serve as mission specialists on the Spacelab 1 mission, which is scheduled for the early 1980s.

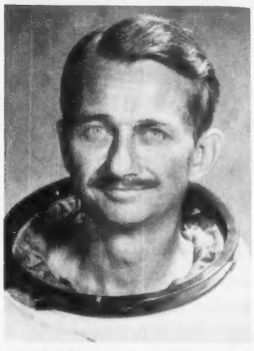
The first fiight of Spacelab is planned to last for seven days and is primarily for verification testing of the Spacelab systems and Spacelab and orbiter interfaces. In addition, some 40 experiments will be on board.

Garriott flew on the second manned Skylab mission of 56 days duration. Parker served as mission scientist and spacecraft communicator during Apollo and Skylab. For the past four years, Parker has been involved in reviewing developments of Spacelab for the astronaut office.

Mission specialists have overall responsibility for the coordination, with the commander and pilot, of Space Shuttle operations in the areas of planning crew activity, use of consumables and interaction of space transportation systems with payloads.

Spacelab, developed and financed by 10 European nations under agreements concluded with the European Space Agency, will be carried in the cargo bay of the Shuttle orbiter. The lab will supply investigators with a fully furnished facility adapted for the weightless environment of space and pressurized for working without spacesuits.

In addition to the commander, pilot and two mission specialists, two payload specialists will be included aboard Spacelab 1—one a European and one a U.S. citizen—who will have primary responsibility for operating the science instruments. With six crewmen onboard, it will be possible to have two operational shifts of three crewmen each, consisting of a mission specialist, commander/pilot and payload specialist.



Garriott

Parker

Third Sun-Earth Satellite Launched

The first spacecraft to be launched to the Sun-Earth libration point—that point in space where the gravitational pull of the Sun just balances that of the Earth-Moon system—was sent into orbit Aug. 12.

ISEE 3, third in a series of international Sun Earth Explorer spacecraft, was sent aloft atop a Delta rocket from NASA's Kennedy Space Center. It will reach the libration point, 1.6 million kilometers away, 78 days after liftoff.

From its vantage point, ISEE 3 will measure the solar wind constantly emitted by the Sun, and other solar phenomena such as Sunspots and solar flares—which are impervious to Earth's influence—while ISEE 1 and 2 measure the effect of these phenomena on the near-Earth environment. The two have been in looping trajectories around the Earth since last fall.

The coordinated effort is expected to result in a better understanding of how the Sun controls the fluctuating near-space environment of Earth, and of a variety of solar-terrestrial phenomena, including weather and climate, energy production and ozone depletion in the atmosphere.

Once the 469-kilogram ISEE 3 reaches libration point, it will be injected into a "halo" orbit by an onboard hydrazine gas propellant system. The propellant will place the spacecraft in an orbit in the ecliptic plane (the plane in which all the planets circle the Sun), 150,000 km above and below the Sun-Earth line, and it will keep the satellite in the correct position to carry out its scientific investigations.

The design of the orbit enables ISEE 3 to pass slightly above and below the ecliptic plane to avoid excessive solar interference with Earth-directed communications. To an Earth-based observer, the spacecraft will appear to be orbiting the Sun, but in fact, it will be tracing a halo above the Earth. One revolution will take approximately six months.

The halo orbit path—the most unusual ever proposed for a NASA space mission—was devised by Dr. Robert W. Farquhar of the Goddard Space Flight Center, who orginated the concept in his doctoral thesis.

According to ISEE 3 project manager Jeremiah J. Madden of Goddard, the unusual orbit was chosen for the spacecraft "because of the relationship between ISEE 3 and the other two ISEE satellites that were launched from Cape Canaveral last October."

"In effect," says Madden, "ISEE 3 will be sort of an early warning satellite for activity on the Sun. It will pick up solar wind or particles speeding away from the Sun a full hour before the two other spacecraft do so. These spacecraft are in highly elliptical orbits ranging from about 480 km to almost 144,800 km above Earth. This tells scientists a lot about the Sun and how it changes with time and distance. In fact, this will be the first time such correlated measurements will ever have been accomplished on a regular basis."

The Delta rocket initially placed the spacecraft in a trajectory aimed at the libration point; in 20 days ISEE 3 was close to the halo orbital position; and the final insertion into orbit will take place some three months later. During the transfer phase from Earth to halo orbit, several unusual trajectory maneuvers were required to place the spacecraft at the accurate insertion point, after which minor stationkeeping maneuvers will take place at irregular intervals. About eight maneuvers per year will be required of the spacecraft hydrazine system to maintain the satellite's equilibrium along the orbital path. ISEE 3 will carry enough hydrazine propellant to assure an orbital lifetime of at least three years.

In addition to providing a far-out Sun-Earth measuring platform, ISEE 3 also will be useful for research activities on the origin of galactic cosmic rays and recently discovered gamma ray bursts. All three of the ISEE spacecraft will be closely observing phenomena at solar maximum for the new 11-year solar cycle, which began in June 1976.

The three-spacecraft mission involves 117 scientific investigators representing 35 universities and 10 nations. ISEE 3 carries 13 different scientific instruments, three of them by foreign investigators in Holland, Germany, and France.

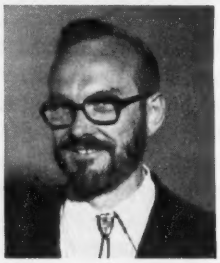
ISEE 1, managed by Goddard, and ISEE 2, managed by the European Space Agency was the first pair of spacecraft designed to be used together to investigate Earth's immediate space environment.

The use of three spacecraft, separated by a variable distance, allows scientists to study the boundaries between interplanetary space and the space controlled by the Earth, and the nature of fluctuations in the boundaries.

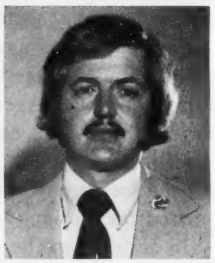
Spacelab Crew Members Chosen

Four American scientists have been named by NASA to serve as payload specialists during the second Spacelab mission scheduled for 1981. Selections are:

- Dr. Loren W. Acton of Palo Alto, Calif., a research scientist at the Lockheed Palo Alto Research Laboratory.
- Dr. John-David F. Bartoe of Reston, Va., a research physicist at the U.S. Naval Research Laboratory, Washington, D.C.
- Dr. Dianne K. Prinz of Alexandria, Va., a research physicist at the U.S. Naval Research Laboratory, Washington, D.C.
- Dr. George W. Simon of Alamagordo, N.M., chief of the solar research branch at the Air Force Geophysics Laboratory with permanent duty location at the Sacramento Peak Observatory, Sunspot, N.M.



Acton



Bartoe

Prinz

Simon

Before flight-time, two of the scientists will be selected to actually fly aboard the orbiting space laboratory and operate the scientific investigations planned for the mission. The other two will operate ground-based experiment equipment and assist the pair in orbit.

The payload specialists were selected by the Spacelab Investigators Working Group, which is composed of the Spacelab 2 principal investigators who will

have experiments aboard the mission. Each payload specialist is a co-investigator on one of the experiments to be flown aboard Spacelab 2.

The position of payload specialist is a new one in the space program. Payload specialists are not professional astronauts and are not required to pilot or operate the Space Shuttle, which will carry the Spacelab on its missions. They will, instead, devote themselves to the operation of experiments just as a scientist would do in a ground-based laboratory except that their laboratory, Spacelab, will be in orbit.

Payload specialists were named in June for the first Spacelab mission, scheduled for launch late in 1980.

The Marshall Space Flight Center is responsible for payload specialist training activities as part of its overall management responsibility for the Spacelab mission. During the actual mission, the payload operations control center will be located at the Johnson Space Center.

Power to Spare—The air-powered jet engine simulator in the Ames transonic wind tunnel is examined by Betty Wong, a NASA computer technician. The engine can produce up to 440 Newtons thrust and operate at speeds of up to 85,000 rpm.

Model Jet Engine Used in Ames Wind Tunnel

An air-powered miniature jet engine simulator is being used in aerodynamic tests at the Ames Research Center in its 3.3 by 3.3-meter transonic wind tunnel. This is the first time this type of test apparatus, used in cooperation with private industry, has been used at the center.

The engine, which simulates an actual jet engine's performance, was developed and built by Tech Development Inc. of Dayton, Ohio and is owned by McDonnell Douglas Aircraft Corporation. It is being used in a major program to develop more economical jet transport aircraft.

Before this type of engine simulator was developed, it was extremely difficult to test jet aircraft models for aerodynamic drag associated with the propulsion system. Its primary task is to simulate the effects of propulsion interference that exist at flight conditions for a NASA/McDonnel Douglas project which is part of the Aircraft Energy Efficiency program being conducted by NASA and various industries.

NASA's Langley Research Center, and McDonnell Douglas are investigating ways of designing airliners and other aircraft to operate more economically. One way to do that is to reduce the drag that affects the aircraft as it flies through the air. This type of research, in which the jet engine simulator will be used, and the first tests of this system at Ames are currently in progress.

The simulator, which resembles a miniature engine, is powered by a high pressure air supply that spins the model's turbine at speeds up to 85,000 rpm. It is about 10 centimeters in diameter and 15 cm long. Because it behaves like an actual jet engine, it accurately duplicates the air flow around and through an aircraft's jet engines and their supporting structures in flight.

The nacelles and pylons, which are the structures that surround and hold the engine to the wing, are designed to facilitate air entry and exit through the engine, but they are a cause of aerodynamic drag. This new equipment will enable engineers to determine causes of drag more accurately than before.

Because the engine operates at high speeds, the bearings that hold the turbine in place are carefully monitored. These bearings are conventional ball type and are lubricated by an oily wick. If they reach a temperature of 150 degrees C, the jet simulator will shut down.

In its first application, the engine is being used to test a technologically advanced wing system that is being researched by NASA and McDonnell Douglas. In future tests, the engine will be mounted on various nacelle/pylon/wing assemblies for wind tunnel testing.

It is anticipated that this technique will play a major role in the development of future V/STOL aircraft as well as conventional transports.

DoE Man Joins NASA

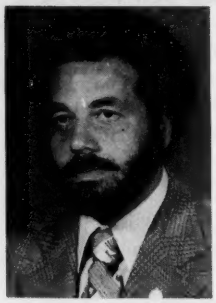
Donald A. Beattie became director of the energy systems division, Office of Aeronautics and Space Technology on Aug. 28. He comes to NASA from the Department of Energy, where he was acting assistant secretary for conservation and solar applications. He joined DoE's predecessor, the Energy Research and Development Administration, in January 1978 as the Deputy Assistant Administrator for solar, geothermal and advanced energy systems.

Before he joined ERDA, Beattie was director, division of advanced energy research and technology, at the National Science Foundation. As such, he was responsible for coordination of all Federal programs in solar and geothermal energy research and development. While at NSF, he chaired the Solar Energy Task Force for Project Independence, which resulted in the forwarding to the Congress of the first comprehensive solar energy R&D program.

Earlier, in January 1973, Beattie was program manager for the lunar surface experiments in the Apollo lunar exploration office at NASA headquarters. He won the NASA Exceptional Service Medal in 1971 for his work on the Apollo program.

Beattie is a Fellow of the American Association for the Advancement of Science, a member of the Geological Society of America, and a member of the American Astronautical Society. He received his bachelor of science degree from Columbia University in 1951 and his master of science degree from the Colorado School of Mines in 1958.

Langley Man Wins Fellowship



Frank E. Godfrey of the Langley Research Center's projects and services contracting branch, procurement division, recently was selected to participate in the Education for Public Management program at Harvard University. Godfrey was one of three employees selected as a result of a NASA-wide competition. Participants for the program are selected from numerous Federal, state and local agencies.

Godfrey has been at Langley since 1974. He earned his undergraduate degree (*summa cum laude*) in business administration from Saint Augustine's College in Raleigh, N.C. in 1967. After an honorable discharge from the Army in 1969, he earned a master's degree in business administration from Texas Southern University, Houston.

Walsh Named MSFC Chief Counsel

William L. Walsh, Jr., has been named Chief Counsel of the Marshall Space Flight Center, effective September 5. He replaces W. E. Guilian, who retired in June.

A native of Boston, Mass., Walsh received a bachelor of science degree from Boston College in 1965 and a doctor of jurisprudence degree from the Catholic University Law School, Washington, in 1968.

For the past 10 years he has worked for the Department of the Navy in Washington, having been promoted last year to Assistant General Counsel of the Navy, with responsibility for coordination of policy and procurement law. He also has served as the Navy's legal member of the Defense Acquisition Regulatory Council.

"The experience Mr. Walsh gained as assistant general counsel and during his previous assignments, particularly in the areas of Government policy and procurement law, congressional liaison and contract administration, makes him well qualified for the assignment as Chief Counsel of MSFC," Marshall director Dr. William R. Lucas said.

Contractor News

Chimex Systems, Inc. a racially mixed firm located in Houston will be performing work for NASA under a $4 million, five-year subcontract with the Computer Sciences Corp. of Falls Church, Va. This latest award marks the fourth NASA contract that has gone to Chimex. Parent contractor (Computer Sciences Corp.) has been awarded the contract for performance of institutional computer systems engineering, development and production operations work at the Johnson center for a five year period. According to NASA procurement officials, one of the major factors contributing to the success of the winning bidder was planned use of minority subcontractors. NASA's minority business awards for the first half of the 1978 fiscal year amount to more than $37 million.

SRI International, Menlo Park, Calif., has been awarded a NASA $1.6 million contract to develop an engineering model of a software-implemented fault tolerance computer. The contract is managed by the Langley center. The computer will be capable of starting and performing several aircraft function applications without manual intervention. These functions include flight control, autopilot, navigation and guidance, and display and master alarms. In addition, the computer will be able to assess aircraft flight phases, such as take off, climb, cruise, descent and landing.

Lockheed Missiles and Space Co., Sunnyvale Calif., has won a $2.7 million contract for development and delivery of flight experiment solar array wing. Awarded by the Marshall center, the contract calls for delivery by May 1980, for a Shuttle orbital flight test in November 1980. The experiment will verify the structural and dynamic characteristics of the solar array wing, its electrical performance and the readiness of solar array technology for planetary and Earth orbit Shuttle payload applications. NASA's Office of Aeronautics and Space Technology is directing the solar array program as part of a larger program which is developing solar electric propulsion for long-term missions in the mid-1980s.

The Charles Stark Draper Laboratory, Inc., Cambridge, Mass., has been awarded a $1.8 million NASA contract to develop an engineering model of a fault-tolerant multiprocessor computer. Under a previous NASA-sponsored effort, the computer concept as conceived by the Draper Laboratory was identified as a viable candidate for use in safety critical avionic and flight control systems of future civil transport aircraft. The computer will be able to start and operate several aircraft function applications without manual intervention, including flight control, autopilot, navigation and guidance and display and master alarms. In addition, it will be able to assess aircraft flight phases, such as takeoff, climb, cruise, descent and landing. This contract is managed by the Langley center.

Gallo Mechanical Contractors, Inc. of New Orleans, has won a NASA contract for construction of an industrial wastewater treatment facility at the Michoud Assembly Facilty. Michoud is a field organization of the Marshall center. Major work underway for Marshall at the facility is construction of external tanks for the Space Shuttle by the Martin Marietta Corp., Denver Division.

Algernon Blair Industrial Contractors, Inc., Norcross, Ga., has won a NASA contract from the Kennedy center for modification to a mobile launcher platform that will serve as a launch platform for Space Shuttle flights from Complex 39. The fixed-price contract is valued at more than $2 million. The platform was used previously to support the manned Apollo lunar landing missions. Modification work, scheduled to begin in late 1978 and be completed 210 days afterward, includes mechanical, electrical and various other systems to supply a blast deck to protect the platform's upper deck during liftoff of the Space Shuttle orbiter.

Unique Plane Delivered—NASA took delivery on Aug. 3 of the NASA/Boeing quiet short-haul research aircraft at fly-away ceremonies at Boeing Field. Left to right are: Donald E. Cumming, Boeing QSRA test manager; Jim Martin, NASA project pilot; John Cochrane, NASA project manager; Bob McCracken, NASA resident manager; Bob Innis, NASA pilot; and George S. Kelley, Boeing QSRA program manager.

NASA-JPL Contract for Solar Cell Study

Automated production of photovoltaic cell assemblies, aimed to reduce sharply the costs of generating electricity directly from the sun, are being studied at Lockheed under a one-year Department of Energy contract, managed by NASA's Jet Propulsion Laboratory, Pasadena, Calif.

Goal of the low-cost solar array project is to produce electricity at 50 cents a peak watt in less than 10 years to supplement the nation's power supply. Present costs are more than $11 a peak watt. A peak watt is the amount of electrical power that can be generated when solar cells are exposed to bright sunshine on a summer day, the ideal condition. Potentially, solar energy can generate up to 1,000 peak watts per square meter of surface. Silicon solar arrays have been used for years to reliably power spacecraft, but their application to terrestrial needs has been limited by high production costs.

The task underway reviews today's production technology to determine what should be retained and will investigate possible new techniques that would help to achieve the goal of lower cost, according to project leader Mike Lopez of the Lockheed Manufacturing Research organization.

It will also include experiments with ion implantation of selected impurities to form junctions (enabling the cell to generate electricity when exposed to direct sunlight) and laser annealing (a candidate process that could supplant the high-cost thermal processes now used to distribute impurities).

As a subcontractor to Lockheed, International Rectifier, Inc., El Segundo, Calif., is assisting in the review and verification of the candidate low-cost processes to convert the silicon wafers into solar cells. Lopez said the study uses three-inch-diameter solar cells that can supply up to one-half peak watt each. Silicon is a sand-like material that is one of the most abundant substances on Earth. It is the same material used to produce electronic components such as integrated circuits and transistors commonly used in microprocessors, calculators, and digital watches.

Lockheed experience in solar arrays is extensive. For the last 15 years, the firm has designed and built a number of electricity-producing arrays that have been flown on NASA and Air Force satellites.

Law in Space—the Next 50 Years

Hamilton DeSaussure, professor of law at the University of Akron (Ohio), spoke on "The Future of International Law in Space" at a recent presentation of the Administrator's Colloquim series, "Profiles of the Future" held at NASA headquarters.

In his talk, DeSaussure pointed out that of four possible sources, treaty and customary law are most likely to develop future international law in space. He went on to discuss what in his view are weaknesses of treaty law. He said that existing treaties on space-related matters will fail to meet complex future needs; that treaties tend to generalize too much and skip hard issues; and that treaties can be renounced too easily by a non-binding claim. He also said that the weak point of the current U.S. Committee on Peaceful Uses of Space, in its attempt to develop a unified code, is the ever-increasing number of U.N. members. As such numbers grow, so also does the lack of probability of consensus.

In a discussion of the geostationary orbit, DeSaussure contended that the issue is not territorial sovereignty, but how to share the resource. Three possible solutions he suggested were: an international space resource authority for allocation of space resources; the establishment of trustee states over resources for the benefit of all; or jointly controlled committees for the administration of scarce resource areas.

Customary law, according to DeSaussure, could be developed to cover: safety and welfare of spacefarers; private enterprise in space; delineation of a border between air space and outer space; and control and development of international spaceports.

DeSaussure concluded that a need exists for more active programs in the training of law students in the emerging discipline of international space law. He also suggested the establishment of an advisory committee on space law patterned after a similar existing State Department committee on the sea.

Patents for Inventions from NASA Research

The Office of General Counsel, NASA Headquarters, announces that the following U.S. patents have been issued by the U.S. Patent Office to NASA for inventions resulting from NASA research. Inquiries concerning them should be directed to the attention of the NASA Patent Counsel of the indicated installation.

Inventor(s) and Employer	Title	Patent No.	Installation
Marion L. Roberts, Max H. Sharpe, Albert C. Krupnick } MSFC	Aluminum or copper substrate panel for selective absorption of solar energy and the method of producing said panel	4,104,134	MSFC
John C. Evans, Jr., LeRC	Method for fabricating solar cells having integral collector grids	4,104,084	LeRC
John C. Evans, Jr. *et al*, LeRC	Application of semiconductor diffusants to solar cells by screen printing	4,104,091	LeRC
Vincent J. Menichelli, Caltech/JPL	Electro-explosive device	4,103,619	NRLO
Morley V. Friedell, Martin Marietta Corp.	Positive isolation inconnect	4,103,712	
Richard A. McKay, Caltech/JPL	"Combuster"	4,104,018	NRLO
George A. Coffinberry, General Electric Co., Cincinnati, Ohio	Fuel delivery system including heat exchanger means	4,104,873	LeRC
Porter R. Ryason, Caltech/JPL	Solar photolysis of water	4,105,517	NRLO
Budley O. Nash, Hoseph Holowach, General Electric Co. Cincinnati, Ohio	Sound-suppressing structure with thermal relief	4,106,587	LeRC
Walter K. Polstorff, MSFC	Simulator method and apparatus for practicing the mating of an observer-controlled object with a target	4,106,218	MSFC
Laurence J. Bement, LaRC	Totally confined explosive welding	4,106,687	LaRC
Frederic S. Dawn, Dale G. Sauers } JSC	Lightweight electrically-powered flexible thermal laminate	4,107,363	JSC
Daniel E. Sokolowsky, LeRC	Heat exchanger	4,107,919	LeRC
Anthony Fortini, LeRC, John M. Kazaroff	Heat exchanger and method of making	4,108,241	LeRC
Larry D. Holly, KSC, James O. Ward, Federal Electric Corp. Paramus, N.J.	Digital automatic gain amplifier	4,109,213	KSC
Gilbert K. Kojima, ARC	Miniature implantable ultrasonic echosonometer	4,109,644	ARC
Robert L. Cason, John J. McStay } KSC	Cable fault locator	4,110,683	KSC
Nelson W. Jalufka, Michael D. Williams, Frank Hohl } LaRC, Russell J. DeYoung, Vanderbilt Univ., Nashville, Tenn.	Volumetric direct nuclear pumped laser	4,110,703	LaRC

Another Dividend from Air and Space

Research and development in aeronautics and space have provided numerous benefits for all Americans—and at a tiny percentage of the tax dollar. Here is an example:

A Sound Guard for Records

Technology originally developed for a series of NASA satellites has produced a commercial product for protecting the sound fidelity of phonograph records. Called Sound Guard, the preservative is a spray-on fluid that deposits a microscopically thin protective coating which reduces friction and prevents the hard diamond stylus from wearing away the softer vinyl material of the disc. It is marketed by the Consumer Products Division of Ball Corp., Muncie, Indiana.

The lubricant technology on which Sound Guard is based originated with NASA's Orbiting Solar Observatory, an Earth-orbiting satellite designed and built by Ball Brothers Research Corp., Boulder, Colo., also a division of the Ball Corporation. Company engineers found a problem early in the OSO program: known lubricants were unsuitable for use on moving parts of the satellite that would be exposed to the vacuum of space for several months. The company, therefore, conducted research on the properties of materials needed for long life in space and developed new lubricants. They worked successfully on seven OSO flights and attracted considerable attention among other aerospace contractors.

Ball Corp. expanded its product line to include consumer products, of which Sound Guard is one of the most recent.

In addition to protecting record grooves, Sound Guard's anti-static quality also retards particle accumulation on the stylus. During a comparison study by a leading U.S. electronic laboratory, a record not treated by Sound Guard had to be cleaned after 50 plays and the stylus had collected a considerable number of small vinyl particles. The Sound Guard-treated disc was still clean after 100 plays, as was its stylus.

For the benefit of all . . .

NASA
National Aeronautics and Space Administration

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